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ABSTRACT

This circular lists suggested uses of insecticides for the control of field crop pests. Suggestions are given for selection, dosage and application of insecticides to control pests in field corn, alfalfa and clover, small grains, soybeans and grain sorghum. (CS)

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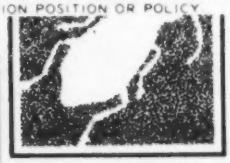
1978 Insect Pest Management Guide

FIELD and FORAGE CROPS



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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

You must be certified as a pesticide applicator to use "restricted use" pesticides. See your county extension adviser for information.

Federal and State Laws

The U.S. Environmental Protection Agency is classifying pesticides as either "general" use or "restricted" use. Anyone applying a restricted-use pesticide must be certified. Only a few pesticides have been classified at this time.

Commercial applicators who apply restricted-use pesticides must be certified. Commercial applicators include not only persons applying a pesticide for hire but also governmental personnel, chemical company representatives, and others involved in demonstrational, regulatory, and public health pest control. Certification as a commercial applicator requires passing a written examination administered by either the Illinois Department of Agriculture or the Department of Public Health.

Private applicators who use restricted-use pesticides "for the purpose of producing any agricultural commodity on property owned or rented by him or as exchange labor (no compensation) on the property of another" must also be certified, either by attending an educational training program or by passing an examination.

Educational training programs for farmers (private applicators) and commercial pesticide applicators are conducted by the Cooperative Extension Service to prepare persons for certification. For additional information, consult your county extension adviser. The actual certification and the issuing of permits or licenses are handled by the Illinois Department of Agriculture or the Department of Public Health.

The chlorinated hydrocarbons — aldrin, chlordane, dieldrin, endrin, heptachlor, and lindane — cannot be used on dairy farms except around the farm residence. This ruling was adopted by the Illinois Department of Public Health.

In 1974 the U.S. Environmental Protection Agency (EPA) suspended the manufacture of aldrin and dieldrin for agricultural purposes. Uses of heptachlor and chlordane on corn were suspended by the EPA on August 1, 1976. However, any product containing heptachlor or chlordane that was formulated before July 29, 1975, may be used for any use listed on the product label. The heptachlor seed-treatment label was unaffected by the suspension order, so heptachlor can continue to be used for this purpose.

Insecticides and Classifications

At the time this publication was in preparation, only a few of the insecticides listed below had been classified for either "restricted" or "general" use by the EPA. Additional insecticides are expected to be classified before the 1978 planting season. Your county extension adviser will have additional information on insecticide restrictions. **An asterisk(*) is used throughout this circular to indicate insecticides classified for "restricted" use by the EPA.**

The chemical names used in this circular may be unfamiliar to you. These names are the common coined chemical names and as such are not capitalized (for example, terbufos). Trade names are capitalized (for example, Counter). In the table of limitations, the trade names are listed first, and the common name is in parentheses following the trade name. In the tables of suggestions, only the trade name is used if there is one. In case of questions, refer to the following list or to the table of limitations:

Trade name	*Common name*	*Classification*
Counter	terbufos	unclassified
Cygon	dimethoate	unclassified
Dasanit	fensulfothion	unclassified
diazinon	diazinon	unclassified
Dibrom	naled	unclassified
Di-Syston	disulfoton	unclassified
Dyfonate	fonofos	unclassified
Dylox	trichlorfon	unclassified
*ethyl parathion	parathion	restricted
Furadan	carbofuran	unclassified
*Guthion	azinphosmethyl	restricted
Imidan	phosmet	unclassified
*Lannate	methomyl	restricted[1]
Lorsban	chlorpyrifos	unclassified
malathion	malathion	unclassified
Meta-Systox R	oxydemetonmethyl	unclassified
methoxychlor	methoxychlor	unclassified
*methyl parathion	methyl parathion	restricted
Mocap	ethoprop	unclassified

[1] All formulations except water-soluble packages are restricted.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
In cooperation with ILLINOIS NATURAL HISTORY SURVEY

COLLEGE OF AGRICULTURE
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COOPERATIVE EXTENSION SERVICE
Urbana, Illinois, December, 1977

SE 024 286

Trade name	*Common name*	*Classification*
*Penncap-M	methyl parathion (microencapsulated)	restricted
Sevin	carbaryl	unclassified
Supracide	methadathion	unclassified
*Systox	demeton	restricted
Thimet	phorate	unclassified
toxaphene	toxaphene	unclassified
Trithion	carbophenothion	unclassified

(Consider all grain fumigants as restricted-use insecticides.)

Pesticide Safety

Certain precautionary steps should be taken when handling insecticides. Some of the insecticides suggested in the publication can be poisonous to the applicator. The farmer is expected to protect himself, his workers, and his family from needless exposure.

When using insecticides, apply all the scientific knowledge available to insure that there will be no illegal residue on the marketed crop. Such knowledge is condensed on the label. READ THE LABEL CAREFULLY AND FOLLOW THE INSTRUCTIONS. But the label should be recent and not from a container several years old. Do not exceed maximum rates suggested; observe the interval between application and harvest; and apply only to crops for which use has been approved. Make a record of the product used, the trade name, the percentage content of the insecticide, dilution, rate of application per acre, and the date or dates of application.

Always handle insecticides with respect. The persons most likely to suffer ill effects from insecticides are the applicator and his family. Accidents and careless, needless overexposure can be avoided. Here are a few rules that if followed will prevent most insecticide accidents:

1. Wear rubber gloves when handling insecticide concentrates.
2. Do not smoke while handling or using insecticides.
3. Keep your face turned to one side when opening, pouring from, or emptying insecticide containers.
4. Leave unused insecticides in their original containers with the labels on them.
5. Store insecticides out of reach of children, irresponsible persons, or animals; store preferably in a locked building. Do not store near livestock feeds. Better yet, buy no more pesticide than you will use. This eliminates a pesticide storage and disposal problem.
6. Wash out and bury, burn, or haul to the refuse dump all empty insecticide containers.
7. Do not put the water-supply hose directly into the spray tank.
8. Do not blow out clogged nozzles or spray lines with your mouth.
9. Wash with soap and water exposed parts of body and clothes contaminated with insecticides.
10. Do not leave puddles of spray on impervious surfaces.
11. Do not apply to fish-bearing or other water supplies.
12. Do not apply insecticides, except in an emergency, to areas with abundant wildlife.
13. Do not apply insecticides near dug wells or cisterns.
14. Do not spray or dust when weather conditions favor drift.
15. Observe all precautions listed on the label.
16. To avoid bee kill, apply insecticides after bee activity has been completed for the day; use the least toxic materials. *Warn beekeepers that you are applying insecticides.*

Policy Statement

Suggestions for the use of insecticides are based on available data. Soil texture, soil pH, rainfall, slope of the field, wind velocity at planting, and other unpredictable factors affect the efficiency. Please report control failures and the circumstances associated with such failures to us.

Requested label clearances for a few uses of some insecticides, carriers, and solvents are uncertain for 1978, since many requests have not yet been officially cleared. Anticipating needed changes in labeling, we began modifying these suggested uses a few years ago. We have attempted to anticipate any further label changes in 1978, but an occasional use may still be canceled. Be sure to check with your county extension adviser if you are in doubt about the insecticide you plan to use. We will make announcements of label changes through the news media to keep you up to date.

Suggestions for Insect Control in 1978

Predicting Need for Soil Insecticides on Corn

The type of crop rotation influences to a great extent whether a soil-insect problem will occur and the kind. Following are some guidelines for predicting soil-insect problems in corn and determining the need for using a soil insecticide at planting time. Exceptions can be expected occasionally since soil-insect problems are influenced by a variety of conditions unrelated to crop rotation — weather, soil type, planting date, hybrid, tillage, natural enemies, and others. Knowledge of soil-insect damage in a particular field in previous years is also helpful, since infestations tend to occur in the same fields and in the same area.

Corn After Soybeans

The potential for soil-insect problems in corn following soybeans is generally low. Soil insecticides are rarely necessary. In most fields of corn after soybeans, a diazinon planter-box seed treatment will be adequate to protect against attack by seed-corn beetles and seed-corn maggots. There are a few exceptions. *Corn rootworms* may occa-

sionally be a problem when beetles deposit their eggs in soybean fields that contain volunteer corn, which when planted to corn the following year may have economic damage. Rootworm beetles will feed on the foliage of soybean plants, and they are especially attracted into soybean fields that are weedy or contain volunteer corn. Good weed control will reduce the attractiveness of soybean fields to rootworm beetles. Clean fields of soybeans will permit soybean-corn rotations with noneconomic damage from corn rootworms. *Black cutworms* may be a problem in corn where excess soybean plant debris remains on the soil surface. *White grubs* are an occasional problem in east-central Illinois in corn after soybeans.

Corn After Corn

The potential for rootworm damage is moderate to severe in the northern two-thirds of Illinois, and a rootworm insecticide may be needed in fields of continuous corn. Wireworms are occasionally a problem in southern areas. See discussion under rootworms.

Corn After Grass Sod

Wireworms and white grubs are potential problems. Apply a soil insecticide at planting time.

Corn After Clover and Alfalfa

Grape colaspis, grubs, wireworms, and cutworms are potential problems. Rootworms may be a problem in northern Illinois in corn following clover or alfalfa. Apply a soil insecticide at planting time.

Corn After Small Grain

There is a slight potential for damage by wireworms, seed-corn beetles, and seed-corn maggots. In most instances, a diazinon planter-box seed treatment will be adequate. If wireworms are present, use a soil insecticide at planting.

Corn Rootworms

Rootworm Situation, 1978. Moderate to severe damage by western and northern corn rootworm larvae is expected in many fields of corn that follow corn in the area north of a line from Belleville to Lawrenceville (see map). The potential for rootworm damage south of this line is low. These predictions are based on a survey of rootworm beetle populations taken in late July, 1977.

Western and northern corn rootworm beetle populations were very high in the northern two-thirds of Illinois in 1977. Corn growers in the potential problem areas should base the need for using a soil insecticide on the abundance of rootworm beetles last summer. If they averaged one or more per corn plant during late July and August, 1977, or if lodging or elbowing occurred during

that time, the need for using a rootworm soil insecticide is high if the field is replanted to corn in 1978.

Rootworm Control by Cultural Practices. Here are some suggestions to aid in control.

1. Crop Rotation. This is the most effective method of preventing corn rootworm larval damage and should be given serious consideration by growers in 1978. It greatly reduces the number of egg-laying beetles on each farm. If feasible, do not grow corn two years in succession in the same field.

Farmers have been concerned about the number of corn rootworm beetles observed in soybean fields during 1977. All research to date indicates that corn following soybeans is unlikely to have a rootworm problem, and consequently would not need to be treated with a soil insecticide. An exception might be when corn is planted after soybeans and there was an extensive infestation of volunteer corn or weeds in the soybeans during August. Corn following alfalfa may benefit from treatment since rootworm beetles occasionally deposit their eggs in alfalfa fields during the bloom stage in August.

Fields of corn planted in late May or June, 1977, may have severe rootworm damage if planted to corn in 1978. Late-planted fields of corn very likely attracted high numbers of rootworm beetles from adjacent fields during August, 1977, seeking pollen and silks to feed upon. They will lay millions of eggs in these late-planted fields of corn. Planting these fields to a crop other than corn in 1978 will contribute toward reducing the overall rootworm population. Any field with 5 or more beetles per plant should be planted to another crop during 1978.

The larvae hatching from rootworm eggs cannot survive on the roots of broadleaf weeds or broadleaf crops (soybeans, small grains, alfalfa, or sorghum). Thus when a crop other than corn is planted in a field whose soil contains millions of rootworm eggs, literally millions of larvae will perish and not emerge as egg-laying beetles.

2. Planting Date and Variety. Plant last those fields that had high populations of rootworm beetles last July and August. Since egg-hatch commences in late May and June, soil insecticides applied in May will be more effective than those applied earlier because they won't have as much time to break down. Plant fields of corn after soybeans before planting fields of corn after corn.

Select a variety that has good standability and root-regeneration capability. No varieties are resistant to corn rootworm larvae, but some have more potential for root regeneration than others.

Rootworm Control With Insecticides. The soil insecticides suggested will give 50 to 70 percent control of corn rootworm larvae. This is adequate to prevent economic larval damage in most fields. In some heavily infested fields, there may be enough surviving larvae to cause economic root damage.

Larvae that are not controlled by the insecticides will emerge as beetles. High beetle numbers in fields last summer may leave the impression that rootworm control was poor, but if plants were standing and well rooted, control was probably acceptable even if populations were high.

Following are suggestions for rootworm control using insecticides:

1. Planting-Time Treatments. Apply Counter, Dyfonate, Furadan, Lorsban, Mocap, or Thimet in a 7-inch band ahead of the press wheel at the recommended rate (see table). Planting-time treatments applied in early April may give marginal control. Consider a late-May cultivator application in these fields, rather than a planting-time treatment.

If a soil insecticide gave good results in 1977, it will probably give adequate control in 1978. Exceptions have occurred when a particular insecticide has been used for several consecutive years in the same field. If an insecticide gave poor control last year, switch to another in 1978.

Research conducted in 1976-77 indicates that switching from a carbamate (Furadan) to an organic phosphate (Counter, Dyfonate, Lorsban, Mocap, or Thimet) may be desirable, particularly if Furadan has been used for several consecutive years in the problem field. In fields with a history of Furadan use, rootworm control with Furadan was marginal in 5 of 17 tests in 1976-77. In fields with a history of two or more years of organic phosphate soil insecticide use, rootworm control with a carbamate (Furadan) was equal to or slightly better than control with the organic phosphates in 11 of 11 tests.

Consequently, if control with Furadan was marginal or poor in 1977, switch to an organic phosphate (Counter, Dyfonate, Lorsban, Mocap, or Thimet) in 1978. In fields where Furadan failures have occurred, it may be advisable to wait longer than one year before using it again. If control with an organic phosphate was poor last year, switch to a carbamate (Furadan).

A word of caution about rotating classes of soil insecticides. In a few instances last year rotation of soil insecticides did not give good results. The performance of an insecticide that gives only fair control of rootworms will not be improved by rotation with other insecticides. Performance might be enhanced under favorable weather conditions or with light infestations.

The theory of rotating classes of rootworm soil insecticides, while basically sound, may be only a short-term solution to a long-term problem. Whenever insecticides, regardless of type, are used continuously and extensively over a large area, insect resistance to insecticides is likely to occur.

Soil Insecticides Suggested for Corn Rootworm Control at Planting, 1978

Insecticide	Class	Ounces of product per 1,000 ft. of row	Pounds of product needed per acre			
			40" rows	38" rows	36" rows	30" rows
Counter 15G	organic phosphate	8	6.7	7.0	7.4	8.7
Dyfonate 20G	organic phosphate	6	5.0	5.3	5.6	6.7
Furadan 10G	carbamate	12	10.0	10.5	11.1	13.3
Lorsban 15G	organic phosphate	8	6.7	7.0	7.4	8.7
Mocap 10G	organic phosphate	12	10.0	10.5	11.1	13.3
Thimet 15G	organic phosphate	8	6.7	7.0	7.4	8.7

During 1977, rootworm control research was conducted at 16 sites with economic infestations. Counter was satisfactory in 15 of 16 tests; Furadan in 14 of 16; Mocap in 14 of 16; Dyfonate in 13 of 16; Thimet in 13 of 16; and Lorsban in 10 of 16. Control in these tests was considered marginal for a treatment if enough brace roots were damaged by larvae to cause yield losses. These tests do not necessarily indicate similar results in 1978, but they are the best guide available.

Liquid formulations of Furadan 4F or Dyfonate 4E may be mixed with water and applied as a spray in a 7-inch band ahead of the press wheel or mixed with liquid fertilizer and applied with a split-boot applicator. Some farmers experienced compatibility or crop injury problems when using liquid insecticide-fertilizer planting-time treatments in 1977. The liquid insecticide *must* be compatible with the liquid fertilizer. A test should be conducted to make certain the mixture is physically compatible before planting. Maintain agitation in the tank after mixing and during application. *Use caution when handling liquid formulations. They are more toxic than granular formulations.* Broadcast applications of liquid and granular insecticides are not cleared for rootworm control.

2. Cultivator Treatments. The best time to apply a basal treatment of a soil insecticide by cultivator is in late May, near the time of egg-hatch. Such a treatment may be more effective than planting-time treatments in early April. Apply granular Dyfonate, Furadan, Mocap, or Thimet in a band at base of plants just ahead of the cultivator shovels and cover the granules with soil.

Cultivator applications of rootworm soil insecticides have some limitations. If rainfall is low for 3 or 4 weeks following the cultivator treatment, the insecticide granules will remain on the soil surface rather than moving down to where the larvae are feeding and control will be marginal. In the case of excess rainfall, it may not be possible to apply the cultivator application at the desired time.

3. Control of Rootworm Beetles. We do not suggest the use of insecticides to control rootworm beetles as a means of reducing or eliminating next year's larval infestations. Research thus far indicates this method of control to be variable. In general, the soil insecticide alone has been as effective as beetle control in late July or early August plus a soil treatment the following spring. At present, we suggest the use of aerial applications of insecticides only to control rootworm beetles where pollination damage may occur due to silk clipping.

Reasons for High Rootworm Beetle Populations in 1977. For the past three years, rootworm beetle numbers have been increasing in Illinois and are now at an all-time high. Climatic conditions favorable to the rootworm are probably the major factors responsible for the increase. Heavy rains immediately following planting hasten the decomposition of the soil insecticides and reduce control. Lack of rainfall may prevent the activation and movement of the soil insecticide from the soil surface to the area where rootworm larvae are feeding.

An increase in acreage of continuous corn, early planting, and low insecticide rates also contribute to increasing rootworm populations. Soil insecticides applied at planting in early to mid-April lose some of their potency by the time rootworm eggs are hatching in late May and June. Late-hatching larvae are not controlled, resulting in high survival and ultimately high beetle numbers. Insecticides applied at less than the labeled rate will result in poor or marginal control.

Use Scouting To Determine Rootworm Potential. The presence or absence of rootworm beetles in a cornfield is an excellent indicator of future rootworm problems. Corn growers can determine the potential for rootworm damage in 1979 by counting western and northern corn rootworm beetles between July 25 and August 25, 1978 in this way:

1. Count beetles in only those fields to be replanted to corn in 1979.

2. Make two and preferably three counts for western and northern corn rootworm beetles at 7- to 10-day intervals between July 25 and August 25 in each field.

3. If you enter a field and discover a "fog" of beetles, do not bother with the detailed counts.

4. Count the total number of western and northern corn rootworm beetles on 50 plants each time. Examine 10 plants selected at random in five areas of the field. It will take about 45 minutes to make your counts in a 40-acre field.

5. Move quietly as you approach a plant in order not to disturb the beetles. Count the beetles on the entire plant. This includes the ear tip, tassel, leaf surface, and behind the leaf axils. Pull the leaves away from the stalk and look in the leaf axils.

6. For the ear-tip count, grasp the ear tip so the silks are enclosed in the palm of the hand, and squeeze before any of the beetles escape. Cut off the ear tip with a knife, cutting only the silks. Open your hand slowly and count the beetles that come out of the silks for each of the 50 plants.

7. Record in a small notebook the number of beetles you find per plant.

If the average is more than one-half beetle per plant for any sampling date, plan to apply a rootworm insecticide in 1979. If a field averages less than one-half beetle per plant for all the counts, it can be planted to corn in 1979 without a soil insecticide treatment.

Rootworm Life Cycle. Western and northern corn rootworm beetles deposit their eggs in the soil at the base

of the corn plants or between the rows during August and September. The eggs overwinter in the soil and commence hatching in late May. Egg-hatch usually takes place over a period of three to five weeks. Consequently, in July and August all stages of the corn rootworm — egg, larva, pupa, and adult — may be found. The rootworm larvae feed on the roots of the corn plants during June, July, and August. When a larva is fully grown (½ inch), it will build a cavity in the soil and go into the pupal, or resting, stage. After 5 to 10 days, the beetle will emerge from the soil. The development from egg hatch to adult emergence will take 27 to 40 days. Under field conditions and after mating, 14 days or more will elapse before the females commence egg laying. Rootworm beetles may deposit up to 1,000 eggs; an average of 500 per female is probably common. Most egg laying in Illinois occurs after August 1, and a high percentage of the eggs are deposited after August 10.

Black Cutworm Control

Early detection of leaf feeding or cutting by cutworms is vital for effective control. When corn plants are beginning to emerge, check fields for signs of leaf feeding, cutting, wilting, or missing plants. Small cutworm larvae (less than ½ inch) feed on the leaves and do not begin cutting plants until they are about half grown. If you find 3 percent or more of the plants being cut and 2 or more half-grown cutworms per 100 plants, a control measure is needed. Apply a Sevin pelletized bait or sprays of Sevin or Dylox at the first sign of cutworm damage. The pelletized bait should be broadcast on the surface of the soil and not incorporated. The sprays should be banded over the row.

Planting-time treatments of Mocap 10G and Lorsban 15G have received label registration by the Environmental Protection Agency. The label for Lorsban 15G states that it "will control moderate to low infestations of cutworms." The label for Mocap 10G states that it will "aid in the control" of black cutworms.

Research indicates that a planting-time treatment of Mocap or Lorsban is relatively effective in controlling light to moderate infestations of cutworms, but control may be unsatisfactory with heavy infestations. Because of the uncertainty in predicting which fields will have light or moderate outbreaks of cutworms, we do not suggest Mocap or Lorsban as planting-time treatments in 1978. It is more feasible to apply control measures when cutworm outbreaks appear.

Planter-Box Seed Treatments

A diazinon planter-box seed treatment will protect against attack by seed-corn beetles and maggots during germination. Use a seed treatment in fields that don't receive a soil insecticide at planting or when Furadan, heptachlor, or chlordane is applied at planting. The diazinon planter-box seed treatment is not needed if Counter, Dyfonate, Lorsban, Mocap, or Thimet is applied at planting. NOTE: Some loss of the seed treater will occur in air planters. Excess dust from the seed treater may also interfere with the monitor in air planters.

No-Till Corn

Soil insecticides can be profitably applied to corn following grass sod, or in any rotation in which grasses and weeds are prevalent. In no-till corn research trials, Furadan has controlled armyworms, billbugs, and flea beetles and has suppressed common stalk borers, first-generation European corn borers, wireworms, and white grubs when applied at 2 pounds active ingredient per acre at planting time in the furrow or as a 7-inch band ahead of the press wheel. Lower rates of Furadan are less effective against this insect complex, but may give better results than other soil insecticides. Based on these data, growers with a no-till corn program may wish to apply Furadan at planting time.

On no-till corn following corn (except in the rootworm area), soybeans, or a small grain, it does not generally pay to apply a soil insecticide. However, a diazinon seed treatment should be used.

Thimet, Dyfonate, Counter, Mocap, and Furadan will give some control of wireworms and white grubs in no-till corn planted in grass sod.

Alfalfa Weevil

In 1978 we expect alfalfa weevils to cause moderate to severe damage to the first cutting of alfalfa in all areas of Illinois. Growers should inspect alfalfa fields closely during April and May for signs of weevil damage.

Pest Management

Insects and related pests play a major role in field crop production in Illinois. Although agronomic practices developed during the past century have reduced the importance of some insect pests, they have increased the importance of others. Agronomic practices such as certain tillage operations, destruction of crop residues, selection of resistant hybrids, adjustment of planting dates, rotation of crops, and so on, if used properly, still serve to help suppress insect populations. Where possible, these practices continue to be used to provide more balanced insect control.

Practical applications of many insect-control techniques continue to be thoroughly investigated. Such control methods as insect sterilization, insect growth regulators, release of insect parasites and predators, attractants for insect baits and traps, propagation and dissemination of insect disease organisms, as well as the use of insecticides, are being pursued. Despite the most optimistic reports, however, it is readily apparent that insecticides will be an important part of pest management for many years to come.

FIELD CORN

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Corn rootworm	June-August	Counter	1[2]	7-inch band	Apply ahead of planter press wheel. See discussion on page 4. Basal treatments during cultivation with Furadan, Dyfonate, Thimet, or Mocap are effective in late May or early June.
		Dyfonate	1[2]		
		Furadan	1[2]		
		Lorsban	1[2]		
		Mocap	1[2]		
		Thimet	1[2]		
Seed-corn beetle	At germination	diazinon	1½ oz. per bu. of seed	On seed	Or as a band treatment, use Dyfonate or Thimet.
Seed-corn maggot	At germination	diazinon	1½ oz. per bu. of seed	On seed	Or apply Counter in the furrow or band treatments of Dyfonate.
Wireworm	May-June	Counter	1[2]	Furrow	Counter and Furadan should be applied in the seed furrow. Except for Dyfonate, apply all others as a 7-inch band ahead of the press wheel. If infestations are severe, control may not be satisfactory. Counter and Thimet are labeled for the reduction of wireworms.
		Dyfonate	4	Broadcast	
		Furadan	2[2]	Furrow	
		Mocap	1[2]	7-inch band	
		Thimet	1[2]	7-inch band	
White grub	May-October	The soil insecticides suggested for wireworms will give partial control of white grubs and grape colaspis. Furadan and Counter should be applied in the seed furrow and the other insecticides in a 7-inch band ahead of the press wheel. However, they are not labeled for these pests.			
Grape colaspis	May-June				
Sod webworm	May-June	toxaphene	2	At base of plant	At time of initial attack.
Cutworms	May-June	Sevin bait	1-2	Broadcast	When feeding starts. Repeat if needed.
		Sevin plus molasses or Tractum	2	Direct at base of plant	Same as above. Use 1 quart of molasses per acre. Apply in the spray mix.
		Dylox spray	1	At base of plant	When feeding starts.
Billbug	May-June	toxaphene	2	At base of plant	Apply sprays as needed.
Garden symphylan	May-July	Dyfonate	2	Broadcast	Before planting, lightly incorporate.
Grasshopper	June-September	Sevin	1	Over row as spray	As needed. For ensilage corn use Sevin, diazinon, or malathion.
		toxaphene	2		
		diazinon	½		
		malathion	1		
Flea beetle	May-June	Sevin	1	Over row as spray	When damage becomes apparent on small corn.
		diazinon	½		
		toxaphene	2		
Armyworm	May-August	Sevin	1½	Over row as spray	At first migration or when leaves below ear level are consumed and worms are eating leaves above ear level.
		malathion	1		
		toxaphene	2½		
		Dylox	1		
		*Lannate[3]	½		
Fall armyworm	July-September	Sevin	1½	In whorls	Granules preferred when worms deep in whorl. If worms are small and out on leaves, sprays are effective. When silking, see suggestions for corn earworm.
		diazinon	1		
		Dylox	1		
		*Lannate[3]	½		
Chinch bug	June-August	toxaphene	2	Spray at base of plant	At start of migration.
Thrips	June	malathion	1	On foliage as spray	When severe wilting and discoloration are noticed.
Japanese beetle	July-August	Sevin	1	Over plant	During the silking period to protect pollination.
Mites	July-August	Di-Syston granules	1	Into whorl	When leaves below ear are being killed and infestation is increasing.
		Thimet granules	1	Over plant	
		Meta-Systox R	½		
		Trithion	1		
Corn leaf aphid	July-August	Thimet granules	1	In whorl	Just before tasseling when aphids are appearing on individual plants. Not after tassel emerges. For seed fields only and not if field is to be detasseled by hand.
		malathion	1	Foliage spray	Apply during late whorl to early tassel when 50% of the plants have light to moderate infestations.
		diazinon	1		

* Use restricted to certified applicators only.
[1] See page 11 for insecticide restrictions.
[2] Based on 40-inch row spacing. Increase rates for narrow rows.
[3] To be applied only by experienced operators or those wearing protective clothing.

FIELD CORN (continued)

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Corn rootworm adults	Late July, early August	Sevin malathion diazinon	1 1 ½	Overall spray or directed towards silk	Before 50% of plants have silked, if there are more than 5 beetles per ear and if silk clipping is observed. Only to protect pollination.
Corn earworm	July-August	Sevin *Lannate[3]	1½ ½	Spray ear zone	Two applications at 3- to 5-day intervals, starting at 30-50% silk.
Corn borer, first generation	June-July	Sevin granules diazinon granules	1½ 1	On upper ⅓ of plant and into whorl	When tassel ratio is 30 to 50, and 50% or more plants show recent borer feeding in whorl.
Corn borer, second generation	Mid-August	Sevin granules diazinon granules Furadan granules	1½ 1 1	Over row	Apply at first hatch when there are 1 or more egg masses per plant.
Southwestern corn borer	August	Furadan granules	1	From ear upward	Direct granules into whorls. Apply when 25% of plants have egg masses or larvae on leaves. Early-planted corn usually escapes damage.

* Use restricted to certified applicators only.
[1] See page 11 for insecticide restrictions.
[3] To be applied by experienced operators or those wearing protective clothing.

STORED GRAIN (Corn, Wheat, and Oats)[1]

Insect	Time of attack	Insecticide and dilution	Dosage	Placement	Suggestions (See table of limitations, page 11)
Angoumois grain moth (earcorn)	April-October (southern ⅓ of Illinois only)	malathion 57% E.C., 3 oz. per gal. water	Apply to runoff	Spray surface and sides May 1 and August 1	Plant tight husk varieties. Store as shelled corn to avoid all but surface damage by angoumois moth.
Meal moths and surface infestations only[2]	April-October	dichlorvos 20% (DDVP, Vapona) plastic resin strip[3]	1 per 1,000 cu. ft. space above grain mass	Attach to ceiling or side wall	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Install June 1 or at storage. Replace in mid-August.
		pyrethrin 6% + piperonyl butoxide 60% E.C., 4½ oz. per gal. water	2 gal. per 1,000 sq. ft.	Spray grain surface, bin walls, and ceiling	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Apply June 1 or at storage and monthly thereafter during summer months
General					
Internal and external feeders Rice and granary weevils Flat grain beetle Saw-toothed grain beetle Rusty grain beetle Foreign grain beetle Cadelle beetle Flour beetle	April-October	malathion 57% E.C., 1 pt. per 3-5 gal. water[4]	3-5 gal. per 1,000 bu.	Spray uniformly as grain is binned	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Protect surface with dichlorvos resin strips or pyrethrin spray as recommended for meal moths.
		*liquid fumigant[5,6]	3-5 gal. per 1,000 bu.	On surface; repeat if necessary	Clean and spray bin with 1.5% malathion to runoff before storage. Store only clean dry grain. Apply in late July and September in the southern half of Illinois; apply in mid-August in the northern half of Illinois. Protect surface with dichlorvos resin strips or pyrethrin spray as recommended for meal moths.
		*methyl bromide + *ethylene dibromide[6,7]	As directed	On surface	
		*aluminum phosphide[6,8]	180 tablets per 1,000 bu.	Tablets 2 feet apart	

* Use restricted to certified applicators only.
[1] Corn need not be treated if harvested after October 1 unless it is to be carried over the following summer. Wheat and oats should be treated if they are to be held for one month or more in storage after harvest.
[2] Remove webbing before treatment.
[3] Effective only in enclosed bins. Kills adult moths but not the eggs or larvae. Several weeks required to effectively control an existing infestation. Also cleared for use in bins of stored soybeans.
[4] Use only the grade of malathion labeled for use on stored grain. Apply after drying, as malathion vaporizes and is lost rapidly when grain is heat-dried.
[5] Some common liquid fumigants are: *carbon bisulfide + *carbon tetrachloride, *ethylene dichloride + *carbon tetrachloride, *ethylene dichloride + *ethylene dibromide + *carbon tetrachloride, etc.
[6] Use with extreme caution. Apply only under calm conditions and when grain temperature is 70° F. or above. Grain should be 8 inches below the lip of the bin and should be leveled before fumigating.
[7] Called 1 the 73 mixture.
[8] Called *Phostoxin. Slow vaporization with a 3-day exposure period.

ALFALFA AND CLOVER

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application[2] (See table of limitations, page 11)
Alfalfa weevil (Spring treatment)	March-June	Furadan[3, 4]	¼	On foliage	Refer to Circular 1136. Or, when 25% of the tips are being skeletonized and there are 3 or more larvae per stem, treat immediately; two treatments may be necessary on first cutting; regrowth following first cutting may need protection. By ground, use a minimum of 20 gal. of finished spray per acre (10 gal. on stubble) or 4 gal. by air. Do not apply during bloom. Instead cut and remove hay.
		*Guthion[3]	½		
		*methyl parathion[3]	½		
		Supracide[3]	½		
		*Lannate[3]	0.9		
		malathion plus methoxychlor	¾		
		diazinon plus methoxychlor (Alfatox)	½ 1		
		Imidan	1		
		*Penncap-M	½		
Clover leaf weevil	March-April	malathion	1	On foliage	When larvae are numerous and damage is noticeable, usually early to mid-April.
Spittlebug	Late April, early May	*Guthion[3]	½	On foliage	When bugs begin to hatch and tiny spittle masses are found in crowns of plants.
		malathion	1		
Aphid	April-May	Cygon or De-Fend	½	On foliage	When aphids are becoming abundant and lady beetle larvae and adults, parasites, and disease are slight.
		diazinon	½		
		malathion	1		
Leafhopper	Early July	Sevin	1	On foliage	When second-growth alfalfa is 4 to 6 inches high, or as needed.
		diazinon	½		
		Cygon or De-Fend	½		
		Dylox	¾		
		Supracide[3]	½		
Webworm	July-August	Sevin	1	On foliage	When first damage appears.
		Dylox	1		
Variegated cutworm	April-June	Sevin bait	1½	On foliage	Cut, remove hay, and spray immediately.
		Dylox	1		
		*methyl parathion[3]	½		
Armyworm	May-June, September	Sevin	1½	On foliage	Only when grasses are abundant.
		malathion	1¼		
		Dylox	1		
Grasshopper	June-September	Cygon or De-Fend	½	On foliage	When grasshoppers are small and before damage is severe. When plants are blooming, do not apply Sevin or Cygon. Apply others only late in day.
		Sevin	1		
		diazinon	½		
		malathion	1¼		
		Furadan[3, 4]	¼		

* Use restricted to certified applicators only.
[1] See page 11 for insecticide restrictions.
[2] Before applying insecticides, be certain to clean all herbicides out of equipment. During pollination, apply very late in day or, if possible, avoid application during bloom.
[3] To be applied only by experienced operators or those wearing protective clothing.
[4] Only for pure stands of alfalfa. When using no more than ¼ pound per acre, allow 7 days between application and harvest. If you use ¼ to ½ pound per acre, allow 14 days to elapse between application and harvest.

SMALL GRAINS (Barley, Oats, Rye, Wheat)

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Grasshopper	June-August	malathion	1	On entire plant	Apply early while grasshoppers are small.
		toxaphene[2]	1½		
Armyworm	May-June	malathion	1¼	On foliage	When worms are still small and before damage is done. Do not use Dylox on rye.
		toxaphene[2]	1½		
		Dylox	¾		
Greenbug	May-June	Cygon	¼	On foliage	When needed. Penncap-M is cleared for greenbug only. Use Cygon and Penncap-M on wheat only.
English grain aphid		*Systox[2]	¼		
		*parathion[2]	¼		
		*Penncap-M	¼		
		malathion	1		
Hessian fly	Sept.-October; April-May	Di-Syston granules	1	In drill row	Use granules in a grass-seeder for susceptible varieties planted before fly-free date.
		Thimet granules	1		

* Use restricted to certified applicators only.
[1] See page 11 for insecticide restrictions.
[2] For use on dairy farms only when alternate material is not available and when insect emergency exists. Do not apply as foliage sprays or dusts to or adjacent to dairy pasture, hay, or forage crops.
[3] To be applied only by experienced operators or those wearing protective clothing.

SOYBEANS

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Bean leaf beetle	May-June, August	Sevin[3] *Guthion[4]	1 ½	On foliage	When leaf feeding becomes severe, but before plants killed or pods eaten.
Grasshopper	June-September	Sevin[3] malathion ULV toxaphene[3]	1 0.6 2½	On foliage	When migration from adjacent crops begins.
Green clover worm	August	Sevin[3] malathion *Lannate[4] Dipel	1 1 ¼ (see label)	On foliage	When damage occurs between blooming and pod fill. Usually requires 12 or more half-grown worms per foot of row and 15% defoliation to justify treatment.
Webworm	June-August	Sevin[3]	1		Usually requires 15% or more defoliation between blooming and pod-fill to justify treatment.
Mites	June-August	Trithion[4] Cygon	¾ ½	On foliage	As needed on field margins and entire field.
Stink bugs	July and August	Sevin[3] *Guthion[4]	1 ½	On foliage	As needed when bugs are numerous; 1 per yard of row may cause damage.
Thrips	June-August	Sevin[3]	¾	On foliage	As needed.
Mexican bean beetle	May-August	Sevin[3] malathion *Penncap-M	1 1½ ½	On foliage	If stand is being reduced on seedling beans or when defoliation exceeds 40% before bloom.

* Use restricted to certified applicators only.
[1] See page 11 for insecticide restrictions on soybeans.
[3] Sevin should not be used at more than 1 lb. per acre. Higher rates may damage plants.
[4] For use on dairy farms only when alternate material is not available and when insect emergency exists. Do not apply as foliage sprays or dusts to or adjacent to dairy pasture, hay, or forage crops.
[4] To be applied only by experienced operators or those wearing protective clothing.

GRAIN SORGHUM

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application (See table of limitations, page 11)
Webworm	After heads form	Sevin	1½	On grain head	When 10 to 25 percent of the heads are infested with 5 or more larvae per head. Pest usually bad in wet seasons on late planted grain.
Corn earworm	After heads form	Sevin	1½	Direct at head or broadcast	When there is an average of 2 worms per head.
Midge	August-September	Cygon diazinon Sevin	¼ ¼ 1½	Direct at head	When 50% of heads have begun to bloom and there are 1 or more midge adults per head.
Corn leaf aphids	All season	Cygon malathion	¼ 0.9	Broadcast	Under drouth conditions when populations are heavy and damage is apparent.
Greenbug	June-July	*parathion[2] Cygon or De-Fend malathion	¼ ¼ 0.9	Broadcast	When greenbug damage is sufficient to cause death of more than 2 normal-sized leaves before the hard-dough stage.
Fall armyworm	July-August	Sevin	1½	Over row	When there is an average of 2 worms per head. Whorl feeding is seldom economic.

* Use restricted to certified applicators only.
[1] See page 11 for insecticide restrictions.
[2] To be applied only by experienced operators or those wearing protective clothing.

GRASS PASTURES AND NONCROP AREAS

Insect	Time of attack	Insecticide[1]	Lb. active ingredient per acre	Placement	Timing of application
Grasshoppers	June-July	Sevin 4-Oil malathion Sevin	1 1 1	On foliage	When nymphs are abundant and before migration into row crops. Treat while hoppers are small.

[1] See page 11 for insecticide restrictions.

LIMITATIONS IN DAYS BETWEEN APPLICATION OF THE INSECTICIDE AND HARVEST OF THE CROP AND OTHER RESTRICTIONS ON THE USE OF INSECTICIDES FOR FIELD CROP INSECT CONTROL

(Blanks in the table denote that the material is not suggested for that specific use in Illinois)

	Worker re-entry times[a] (hours)	Field corn			Sorghum	Forage crops			
		Seed and soil	Grain	Ensilage and stover		Alfalfa	Clover	Pasture	Seed
Counter (terbufos)	...	A	...	...	...	...	...	...	...
Cygon (dimethoate)	...	...	...	...	28	10,B	...	...	...
De-Fend (dimethoate)	...	...	...	...	28	10,B	...	...	...
diazinon	...	A	...	0	7	7	7	...	...
Di-Syston (disulfoton)	...	...	40	40	...	...	...	...	...
Dyfonate (fonofos)[b]	...	A	45	45	...	...	...	...	...
Dylox (trichlorfon)	...	...	C	C	...	0	0	0	...
*parathion[b]	48	...	...	...	12	...	...	...	...
Furadan (carbofuran)[b]	...	A	...	D	...	7,B	...	...	...
*Guthion (azinphosmethyl)[b]	24	...	...	...	...	16,B	16,B	...	...
Imidan (phosmet)	...	...	...	...	...	7,B	...	...	...
*Lannate (methomyl)[b]	...	...	3	3	...	7	...	...	...
Lorsban (chlorpyrifos)	...	A	...	...	...	...	...	...	...
malathion	...	...	5	5	7	0	0	0	0
Meta-Systox R (oxydemetonmethyl)	...	...	7	7	...	...	...	...	...
*methyl parathion[b]	48	...	...	...	...	15	15	15	15
Mocap (ethoprop)	...	A	...	...	...	...	...	...	...
*Penncap-M[c]	...	...	...	...	...	15	...	...	...
Sevin (carbaryl)	...	...	0	0	21	0	0	0	...
Supracide[b]	...	...	...	...	...	10,G	...	...	...
Thimet (phorate)	...	A	30,H	30,H	...	...	...	...	...
toxaphene	...	...	A	I	...	...	...	...	...
Trithion (carbophenothion)[b]	48	...	21,E	21,E	...	...	...	...	...

		Barley		Oats		Rye		Wheat		Soybeans	
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Forage
Cygon (dimethoate)	...	...	...	...	...	...	...	60	60	21	5
Dipel (*Bacillus thuringiensis*)	...	...	...	...	...	...	...	...	...	0	0
Di-Syston (disulfoton)	...	...	...	...	...	...	...	...	K	...	...
Dylox (trichlorfon)	...	21	21	21	21	...	...	21	21	...	...
*Guthion (azinphosmethyl)[b]	24	...	...	...	...	...	...	...	...	45	F
*Lannate (methomyl)[b]	...	...	...	...	...	...	...	...	...	14	7
malathion	...	7	7	7	7	7	7	7	7	3	3
*parathion[b]	48	15	15	15	15	...	...	15	15	...	...
*Penncap-M[c]	...	...	...	...	...	...	...	15	15	20N	20N
Sevin (carbaryl)	...	...	...	...	...	...	...	...	...	0	0
*Systox (demeton)[b]	48	45,L	...	45,L	...	...	...	45,L	...	...	...
Thimet (phorate)	...	...	...	...	...	...	...	...	M	...	...
toxaphene	...	A	J	A	J	A	J	A	J	21	J
Trithion (carbophenothion)[b]	48	...	...	...	...	...	...	...	...	7	J

* Use restricted to certified applicators only.

[a] Workers should be warned in advance of treatments. Workers may not enter fields treated with the insecticides without wearing protective clothing for the intervals indicated. They may not enter a field treated with other insecticides until the spray has dried or the dust has settled without wearing protective clothing. Protective clothing includes a hat, long-sleeved shirt, long-legged pants, and shoes and socks.

[b] Sprays to be applied only by experienced operators wearing proper protective clothing.

[c] Microencapsulated.

A. No specific restriction when used as recommended.

B. Apply only once per cutting, and do not apply during bloom.

C. Three applications may be made per season. Can be applied up to harvest.

D. Do not make a foliar application if Furadan 10 granules were applied at more than 10 pounds per acre at planting. Do not make more than two foliar applications per season.

E. Make no more than one application per season.

F. Do not graze or feed treated vines to livestock.

G. Make no more than one foliage and one stubble application per cutting.

H. Besides treatment at planting, one more application can be made at cultivation or over the corn later in the season.

I. Do not feed treated forage to dairy animals. Do not feed sprayed forage or granular-treated corn silage to livestock fattening for slaughter. Do not graze meat animals on granular-treated stover within 28 days of slaughter.

J. Do not graze or feed treated forage to dairy animals or animals being finished for slaughter.

K. Do not graze treated wheat within 30 days of treatment.

L. Apply no more than twice per season with at least 14 days between applications. Do not graze treated fields.

M. Do not graze treated wheat within 45 days of treatment.

N. Make no more than two applications per season.

References

This circular lists only suggested uses of insecticides for the control of many Illinois field crop pests, and is not designed to discuss other methods of control. Fact sheets discussing nonchemical control methods, descriptions of specific insects, and their life history and biology (designated by NHE numbers) can be obtained from offices of county extension advisers or by writing to Entomology Extension, 169 Natural Resources Building, Urbana, Illinois 61801. The following fact sheets about the insects mentioned in the circular are available:

Alfalfa Weevil — NHE-89
Angoumois Grain Moth — NHE-62
Aphid — NHE-14 and 19
Armyworm — NHE-21
Bean Leaf Beetle — NHE-67
Billbug — NHE-37
Chinch Bug — NHE-35
Clover Leaf Weevil — NHE-12
Clover Root Curculio — NHE-71
Corn Earworm — NHE-33
Corn Leaf Aphid — NHE-29
Corn Rootworm — NHE-26
Cutworm — NHE-38
Fall Armyworm — NHE-34
Flea Beetle — NHE-36
Garden Webworm — NHE-42
Grape Colaspis — NHE-25
Grasshopper — NHE-74
Green Clover Worm — NHE-75
Internal and External Feeders — NHE-64 and 65
Leafhopper — NHE-22
Meal Moths — NHE-63
Sod Webworms — NHE-42
Spittlebug — NHE-13
Sweet Clover Weevil — NHE-15
Thrips — NHE-39
White Grub — NHE-23
Wireworm — NHE-43

The following circulars can be obtained from county extension advisers or by writing to the Office of Publications, College of Agriculture, Urbana, Illinois 61801:

Circular 898, Insect Pest Management Guide — Livestock and Livestock Barns

Circular 900, Insect Pest Management Guide — Home, Yard, and Garden

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